Claims

1. A Doherty amplifier comprising:

a power splitter having a first output and a second output, wherein

the first output is connected to a main power splitter having first and second outputs which differ in phase by 90°; and

the second output is connected to an auxiliary power splitter having first and second outputs which differ in phase by 90°;

a main final stage amplifier comprising first and second main paired amplifiers, the inputs of which are connected to the first and second outputs of the main power splitter;

an auxiliary final stage amplifier comprising first and second auxiliary paired amplifiers, the inputs of which are connected to the first and second outputs of the auxiliary power splitter;

wherein

the output from the first main paired amplifier is connected to the output from the first auxiliary paired amplifier by an impedance inverter; and

the output from the second main paired amplifier is connected to the output from the second auxiliary paired amplifier by an impedance inverter;

the amplifier being arranged such that a relative phase shift is introduced to the signals input to the main and auxiliary power splitters to offset the phase shift of the impedance inverters.

2. A Doherty amplifier as claimed in claim 1, further comprising:

a main driver amplifier connected between the first output of the power splitter and the input of the main power splitter; and

an auxiliary driver amplifier connected between the second output of the power splitter and the input of the auxiliary power splitter.

3. A Doherty amplifier as claimed in claim 1 or 2, wherein the phase of the second outputs of the main and auxiliary power splitters lead the phases of the corresponding first outputs of these splitters.

4. A Doherty amplifier as claimed in claim 1 or 2, wherein the phases of the second outputs of the main and auxiliary power splitters lag behind the phases of the corresponding first outputs of these splitters.

5. A Doherty amplifier as claimed in any one of claims 1 to 4, wherein the power splitter introduces a phase shift between the first and second outputs to offset the phase shift of the impedance inverters.

6. A Doherty amplifier as claimed in any one of claims 2 to 5, wherein at least one of the main driver amplifier and auxiliary driver amplifier introduce a relative phase shift to the input of the corresponding main or auxiliary power splitter to offset the shift of the impedance inverters.

7. A Doherty amplifier as claimed in any one of claims 1 to 6, further comprising a combiner having a first input port connected to the output of the first auxiliary amplifier and a second input port connected to the output of the second auxiliary amplifier,

the combiner being adapted to introduce a phase change between the signals received at the first and second input ports opposite to the phase change introduced by the auxiliary power splitter and to combine these two signals at an output port.

8. A Doherty amplifier as claimed in claim 7, wherein the phase change is 90°.

9. A Doherty amplifier as claimed in claim 6, 7 or 8, further comprising a load connected to the output of the combiner via a further impedance transformer.

10. A Doherty amplifier as claimed in any one of claims 6 to 9, further comprising:

a load connected to the output of the combiner;

a first combiner impedance transformer connected between the first auxiliary amplifier and the first input port of the combiner; and

a second combiner impedance transformer connected between the second auxiliary amplifier and the second input port of the combiner.

11. A Doherty amplifier as claimed in any one of claims 2 to 10, wherein at least one of the main driver amplifier and auxiliary driver amplifier are single ended.

12. A Doherty amplifier as claimed in any one of claims 2 to 10, wherein at least one of the main driver amplifier and auxiliary driver amplifier comprise a pair of balanced amplifiers.

13. A Doherty amplifier as claimed in any one of claims 2 to 12, comprising a plurality of main driver amplifiers connected in cascade before the main power splitter.

14. A Doherty amplifier as claimed in any one of claims 2 to 13, comprising a plurality of auxiliary driver amplifiers connected in cascade before the auxiliary power splitter.

15. A method of amplifying an input signal, the method comprising:

splitting the input signal into a main signal and an auxiliary signal;

splitting the main signal into a first main signal and second main signal which differ in phase by 90°;

splitting the auxiliary signal into a first auxiliary signal and a second auxiliary signal which differ in phase by 90°;

amplifying the first main signal and the second main signal;

amplifying the first auxiliary signal and the second auxiliary signal;

inverting the impedance of the amplified first main signal;

adding the impedance inverted amplified first main signal to the amplified first auxiliary signal thereby creating a first added signal;

inverting the impedance of the amplified second main signal

adding the impedance inverted amplified second main signal to the amplified second auxiliary signal thereby creating a second added signal;

wherein a relative phase shift is introduced to the signals during said steps of splitting to offset the phase shift of said steps of inverting.

16. A method according to claim 15, further comprising:

amplifying the main signal prior to said step of splitting the main signal;

amplifying the auxiliary signal prior to said step of splitting the auxiliary signal;

17. A method according to claim 15 or 16, further comprising:

combining the first and second added signals by introducing a phase change between the first and second added signals opposite to the phase change introduced during said step of splitting the auxiliary signal.